

CLAIMS

1. A method for treating zirconium metal, the method comprising chemically depassivating the zirconium metal.

2. A method for treating zirconium sponge, the method comprising chemically depassivating the zirconium sponge to form treated zirconium sponge.

3. A method as claimed in claim 2 wherein the zirconium sponge is chemically depassivated by treatment with a source of fluoride ions.

4. A method as claimed in claim 3 wherein the source of fluoride ions is an acidified solution containing fluoride ions.

5. A method as claimed in claim 3 wherein the source of fluoride ions is hydrofluoric acid.

6. A method for treating zirconium sponge, the method comprising treating the zirconium sponge with a solution containing fluoride ions to form treated zirconium sponge.

7. Treated zirconium sponge prepared by a method as claimed in any one of claims 2-6.

8. Zirconium sponge comprising an agglomerate of zirconium particles and having a surface layer containing fluorine containing compounds at least partially coating at least some of the particles.

9. Zirconium sponge as claimed in claim 8 wherein the fluorine containing compounds are zirconium fluoride compounds.

10. Zirconium sponge as claimed in claim 9 wherein the zirconium fluoride compounds have the formula  $Zr_xF_y \cdot nH_2O$ .

11. A method of manufacturing a magnesium-zirconium master alloy, the method comprising the steps of:

(a) mixing treated zirconium sponge as claimed in claim 7 or zirconium sponge as claimed in any one

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of claims 8-10 with molten magnesium/magnesium alloy to form a magnesium-zirconium melt containing dissolved zirconium and zirconium particles; and

- 5 (b) casting the magnesium-zirconium melt to solidify as the magnesium-zirconium master alloy.

12. A magnesium-zirconium master alloy manufactured by a method as claimed in claim 11.

10 13. A magnesium-zirconium master alloy as claimed in claim 12 containing 10-50% by weight zirconium.

14. A magnesium-zirconium master alloy as claimed in claim 12 containing 20-40% by weight zirconium.

15 15. A magnesium-zirconium master alloy as claimed in any one of claims 12-14 wherein 90% of the zirconium particles are sized less than 5 $\mu$ m.

16. A magnesium-zirconium master alloy containing dissolved zirconium and zirconium particles in the substantial absence of halide inclusions, wherein 90% of the zirconium particles are sized less than 5 $\mu$ m.

20 17. A magnesium-zirconium master alloy as claimed in claim 15 or claim 16 wherein 90% of the zirconium particles are sized less than 3 $\mu$ m.

18. A method of adding zirconium as an alloying element to molten magnesium/magnesium alloy, the method comprising mixing treated zirconium sponge as claimed in claim 7 or zirconium sponge as claimed in any one of claims 8-10 with the molten magnesium/magnesium alloy.

25 19. A method of adding zirconium as an alloying element to molten magnesium/magnesium alloy, the method comprising mixing a magnesium-zirconium master alloy as claimed in any one of claims 12-17 with the molten magnesium/magnesium alloy.

30 20. A magnesium alloy containing zirconium prepared by a method as claimed in claim 18 or claim 19.